RECORDING MEDIUM HAVING DATA STRUCTURE FOR MANAGING REPRODUCTION OF MULTIPLE COMPONENT DATA RECORDED THEREON AND RECORDING AND REPRODUCING METHODS AND APPARATUSES

FOREIGN PRIORITY

[0001] The present invention claims priority under 35 U.S.C. 119 on Korean Application No. 10-2002-0072517 filed November 20, 2002; the contents of which are incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a recording medium having a data structure for managing reproduction of multiple component data recorded thereon as well as methods and apparatuses for reproduction and recording.

Description of the Related Art

[0003] The standardization of new high-density read only and rewritable optical disks capable of recording large amounts of high-quality video and audio data has been progressing rapidly and new optical disk related products are expected to be commercially available on the market in the near future. The Blu-ray Disc Rewritable (BD-RE) is one example of these

new optical disks.

[0004] Fig. 1 illustrates the file structure of the BD-RE. The file structure or data structure provides for managing the reproduction of the video and audio data recorded on the BD-RE. As shown, the data structure includes a root directory that contains at least one BDAV directory. The BDAV directory includes files such as 'info.bdav', 'menu.tidx', and 'mark.tidx', a PLAYLIST subdirectory in which playlist files (*.rpls and *.vpls) are stored, a CLIPINF subdirectory in which clip information files (*.clpi) are stored, and a STREAM subdirectory in which MPEG2-formatted A/V stream clip files (*.m2ts) corresponding to the clip information files are stored. In addition to illustrating the data structure of the optical disk, Fig. 1 represents the areas of the optical disk. For example, the general information file info.bdav is stored in a general information area or areas on the optical disk.

[0005] Because the BD-RE data structure and disk format as illustrated in Fig. 1 is well-known and readily available, only a brief overview of the file structure will be provided in this disclosure.

[0006] As alluded to above, the STREAM directory includes MPEG2-formatted A/V stream files called clips or clip files. The STREAM directory may also include a special type of clip referred to as a bridge-clip A/V stream file. A bridge-clip is used for making seamless connection between two or more presentation intervals selected in the clips, and generally have a small data size compared to the clips. The A/V stream includes source packets of video and audio data. For example, a source packet of video data includes a

header and a transport packet. A source packet includes a source packet number, which is generally a sequentially assigned number that serves as an address for accessing the source packet. Transport packets include a packet identifier (PID). The PID identifies the sequence of transport packets to which a transport packet belongs. Each transport packet in the sequence will have the same PID.

[0007] The CLIPINF directory includes a clip information file associated with each A/V stream file. The clip information file indicates, among other things, the type of A/V stream associated therewith, sequence information, program information and timing information. The sequence information describes the arrival time basis (ATC) and system time basis (STC) sequences. For example, the sequence information indicates, among other things, the number of sequences, the beginning and ending time information for each sequence, the address of the first source packet in each sequence and the PID of the transport packets in each sequence. A sequence of source packets in which the contents of a program is constant is called a program sequence. The program information indicates, among other things, the number of program sequences, the starting address for each program sequence, and the PID(s) of transport packets in a program sequence.

[0008] The timing information is referred to as characteristic point information (CPI). One form of CPI is the entry point (EP) map. The EP map maps a presentation time stamp (e.g., on an arrival time basis (ATC) and/or a system time basis (STC)) to a source packet address (i.e., source

packet number). The presentation time stamp (PTS) and the source packet number (SPN) are related to an entry point in the AV stream; namely, the PTS and its related SPN point to an entry point on the AV stream. The packet pointed to is often referred to as the entry point packet.

[0009] The PLAYLIST directory includes one or more playlist files. The concept of a playlist has been introduced to promote ease of editing/assembling clips for playback. A playlist file is a collection of playing intervals in the clips. Each playing interval is referred to as a playitem. The playlist file, among other things, identifies each playitem forming the playlist, and each playitem, among other things, is a pair of IN-point and OUT-point that point to positions on a time axis of the clip (e.g., presentation time stamps on an ATC or STC basis). Expressed another way, the playlist file identifies playitems, each playitem points to a clip or portion thereof and identifies the clip information file associated with the clip. The clip information file is used, among other things, to map the playitems to the clip of source packets.

[0010] A playlist directory may include real playlists (*.rpls) and virtual playlists (*.vpls). A real playlist can only use clips and not bridge-clips. Namely, the real playlist is considered as referring to parts of clips, and therefore, conceptually considered equivalent in disk space to the referred to parts of the clips. A virtual playlist can use both clips and bridge-clips, and therefore, the conceptual considerations of a real playlist do not exist with virtual playlists.

[0011] The info.bdav file is a general information file that

provides general information for managing the reproduction of the A/V stream recorded on the optical disk. More specifically, the info.bdav file includes, among other things, a table of playlists that identifies the file names of the playlist in the PLAYLIST directory of the same BDAV directory.

[0012] The menu.tidx, menu.tdt1 and menu.tdt2 files store information related to menu thumbnails. The mark.tidx, mark.tdt1 and mark.tdt2 files store information that relates to mark thumbnails. Because these files are not particularly relevant to the present invention, they will not be discussed further.

[0013] In the BD-RE standard, video data, audio data, and subtitle data are multiplexed together on a transport packet basis in the same clip file. As a result, it is difficult to deal with just one component of this clip of multiple component data. The video data is generally the main component data, and it may be desired to change or replace one of the auxiliary component data such as the audio data. For example, it may be desired to replace the audio data component that provides Korean language for a movie represented by the video data component with a different audio data component that provides English language for the movie. Because the audio data is recorded with the video data in the same clip file, this replacement can not take place.

[0014] The standardization for high-density read-only optical disks such as the Blu-ray ROM (BD-ROM) is still under way. An effective data structure for managing multiple component data recorded on the

high-density read-only optical disk such as a BD-ROM is not yet available.

SUMMARY OF THE INVENTION

[0015] The recording medium according to the present invention includes a data structure for managing multiple component data.

[0016] In one exemplary embodiment, the recording medium includes multiple component data with each component stored in a different file. As such, each component may be dealt with independently. In one exemplary embodiment, each clip file includes data of one of the multiple components. For example, one clip file includes video data, and at least one other clip file includes auxiliary data. The auxiliary data may be audio data, subtitle data, enhanced data, etc. Examples of enhanced data include html data, Java data, CGI data, xml data, etc.

[0017] In one exemplary embodiment, each clip file is divided into units of data, and each unit of data includes one or more entry points. The number of entry points forming a unit of data may be fixed or variable for a clip file. Furthermore, the units of data from different clip files are not interleaved.

[0018] The present invention further provides apparatuses and methods for recording and reproducing the data structure according to the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The above features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0020] Fig. 1 illustrates the prior art file or data structure of a rewritable optical disk according to the Blu-ray Disc Rewritable (BD-RE) standard;

[0021] Figs. 2 illustrates an exemplary embodiment of a recording medium file or data structure according to the present invention;

[0022] Fig. 3 illustrates an example of a recording medium having the data structure of Fig. 2 stored thereon;

[0023] Figs. 4 illustrates an embodiment of the data structure associated with managing multiple component data for use in the data structure according to Fig. 2;

[0024] Fig. 5 illustrates one embodiment of the structure of the jumping units in Fig. 4;

[0025] Fig. 6 illustrates another embodiment of the structure of the jumping units in Fig. 4;

[0026] Fig. 7 illustrates a schematic diagram of an embodiment of an optical disk recording and reproduction apparatus of the present invention; and

[0027] Fig. 8 illustrates a portion of the recording and

reproducing apparatus of Fig. 7 in greater detail.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] In order that the invention may be fully understood, exemplary embodiments thereof will now be described with reference to the accompanying drawings.

[0029] A high-density recording medium such as a high density optical disk, for example, a Blu-Ray ROM (BD-ROM), BD-RE, etc. in accordance with the invention may have a file or data structure for managing reproduction of video and audio data as shown in Fig. 2. Many aspects of the data structure according to the present invention shown in Fig. 2 are similar to that of the BD-RE standard discussed with respect to Fig 1. As such these aspects will not be described in great detail.

[0030] As shown in Fig. 2, the root directory contains at least one DVP directory. The DVP directory includes a general information file info.dvp, menu files menu.tidx, menu.tdt1 among others, a PLAYLIST directory in which playlist files (e.g., real (*.rpls) and virtual (*.vpls)) are stored, a CLIPINF directory in which clip information files (*.clpi) are stored, and a STREAM directory in which MPEG2-formatted A/V stream clip files (*.m2ts), corresponding to the clip information files, are stored.

[0031] The STREAM directory includes MPEG2-formatted A/V stream files called clips or clip files. The A/V stream includes source packets of video and audio data. For example, a source packet of video data includes a

header and a transport packet. A source packet includes a source packet number, which is generally a sequentially assigned number that serves as an address for accessing the source packet. Transport packets include a packet identifier (PID). The PID identifies the sequence of transport packets to which a transport packet belongs. Each transport packet in the sequence will have the same PID.

[0032] The CLIPINF directory includes a clip information file associated with each A/V stream file. The clip information file indicates, among other things, the type of A/V stream associated therewith, sequence information, program information and timing information. The sequence information describes the arrival time basis (ATC) and system time basis (STC) sequences. For example, the sequence information indicates, among other things, the number of sequences, the beginning and ending time information for each sequence, the address of the first source packet in each sequence and the PID of the transport packets in each sequence. A sequence of source packets in which the contents of a program is constant is called a program sequence. The program information indicates, among other things, the number of program sequences, the starting address for each program sequence, and the PID(s) of transport packets in a program sequence.

[0033] The timing information is referred to as characteristic point information (CPI). One form of CPI is the entry point (EP) map. The EP map maps a presentation time stamp (e.g., on an arrival time basis (ATC) and/or a system time basis (STC)) to a source packet address (i.e., source

packet number). The presentation time stamp (PTS) and the source packet number (SPN) are related to an entry point in the AV stream; namely, the PTS and its related SPN point to an entry point on the AV stream. The packet pointed to is often referred to as the entry point packet, and packets between entry points provided in the EP map are collectively referred to as an entry point.

[0034] The PLAYLIST directory includes one or more playlist files. The concept of a playlist has been introduced to promote ease of editing/assembling clips for playback. A playlist file is a collection of playing intervals in the clips. Each playing interval is referred to as a playitem. The playlist file, among other things, identifies each playitem forming the playlist, and each playitem, among other things, is a pair of IN-point and OUT-point that point to positions on a time axis of the clip (e.g., presentation time stamps on an ATC or STC basis). Expressed another way, the playlist file identifies playitems, each playitem points to a clip or portion thereof and identifies the clip information file associated with the clip. The clip information file is used, among other things, to map the playitems to the clip of source packets.

[0035] The info.dvp file is a general information file that provides general information for managing the reproduction of the A/V streams recorded on the optical disk. More specifically, the info.dvp file includes, among other things, a table of playlists that identifies the file names of the playlists in the PLAYLIST directory. The info.dvp file will be discussed in greater detail below with respect to the embodiments of the present invention.

[0036] In addition to illustrating the data structure of the recording medium according to an embodiment of the present invention, Fig. 2 represents the areas of the recording medium. For example, the general information file is recorded in one or more general information areas, the playlist directory is recorded in one or more playlist directory areas, each playlist in a playlist directory is recorded in one or more playlist areas of the recording medium, etc. Fig. 3 illustrates an example of a recording medium having the data structure of Fig. 2 stored thereon. As shown, the recording medium includes a file system information area, a data base area and an A/V stream area. The data base area includes a general information file and playlist information area and a clip information area. The general information file and playlist information area have the general information file recorded in a general information file area thereof, and the PLAYLIST directory and playlist files recorded in a playlist information area thereof. The clip information area has the CLIPINFO directory and associated clip information files recorded therein. The A/V stream area has the A/V streams for the various titles recorded therein.

[0037] Video and audio data are typically organized as individual titles; for example, different movies represented by the video and audio data are organized as different titles. Furthermore, a title may be organized into individual chapters in much the same way a book is often organized into chapters.

[0038] Because of the large storage capacity of the newer,

high-density recording media such as BD-ROM and BD-RE optical disks, different titles, various versions of a title or portions of a title may be recorded, and therefore, reproduced from the recording media. For example, video data representing different camera angles may be recorded on the recording medium. As another example, versions of title or portions thereof associated with different languages may be recorded on the recording medium. As a still further example, a director's version and a theatrical version of a title may be recorded on the recording medium. Or, an adult version, young adult version and young child version (i.e., different parental control versions) of a title or portions of a title may be recorded on the recording medium. Each version, camera angle, etc. represents a different reproduction path, and the video data in these instances is referred to as multiple reproduction path video data. It will be appreciated that the above examples of multiple reproduction path video data are not limiting, and the present invention is applicable to any type or combination of types of multiple reproduction path video data.

[0039] As alluded to above, the data recorded on a high density recording medium such as high density optical disk (e.g., BD-ROM) includes multiple component data. Typically video data is the main component data, with the other component data being characterized as auxiliary component data. The auxiliary component data may be audio data, graphic data (e.g., subtitle data, graphics, etc.). The embodiments of the present invention further consider enhanced data as auxiliary component data. Enhanced data includes newer forms of data such as Java data, html data, xml data,

CGI data, etc.

[0040] As will be described in detail below, the embodiments of the present invention provide a recording medium with a data structure for managing reproduction of multiple component data recorded on the recording medium. The embodiments of the present invention further provide methods and apparatuses for recording and reproducing the described data structure.

[0041] Fig. 4 illustrates a first embodiment of managing multiple component data according to the present invention. In this embodiment, a main component stream and each auxiliary component stream are managed separately as multiple clip files. In the example of Fig. 4, the main component stream such as a video stream is managed as a first clip file Clip File #1. A first auxiliary component stream such as audio data is managed as a second clip file Clip File #2, and a third auxiliary component stream such as html data is managed as a third clip file Clip File #3.

[0042] The first, second and third clip files Clip Files #1, #2, #3 are recorded in a data recording area of the recording medium (e.g., a BD-ROM) without interleaving. For example, as shown in FIG. 4, the data in each of the first-third clip files Clip Files #1, #2, #3 are divided into units of data referred to as jumping units (JUs), and the jumping units in each of the of the first-third clip files Clip Files #1, #2, #3 are recorded without being interleaved. Namely, each of the first-third clip files Clip Files #1, #2, #3 forms a separate block of data on the recording medium. As such, the different

component data streams may be managed independently of one another.

[0043] Even though the different component data streams may be managed separately, the portions of the different component data streams may be intended for reproduction in conjunction with one another. As shown in Fig. 4, the data structure of this embodiment manages the reproduction of the different component data steams on a jumping unit basis. Namely, each jumping unit includes a jumping unit identifier. The jumping unit identifiers indicate an order that the a reproducing apparatus should reproduce the jumping units so that if desired, jumping units of data for different component data streams may be reproduced in conjunction with one another (e.g., simultaneously).

[0044] As shown in Fig. 4, the first clip file Clip File #1 includes jumping units with jumping unit identifiers JU#1, JU#4, JU#5, JU#8, JU#9 and JU#12. The second clip file Clip File #2 includes jumping units with jumping unit identifiers JU#2, JU#6 and JU#10; and the third clip file Clip File #3 includes jumping units with jumping unit identifiers JU#3, JU#7 and JU#11. During reproduction, the reproducing apparatus (e.g., an optical disk reproducing apparatus such as described in detail below) reads out the video data of the main component stream corresponding to a first jumping unit JU #1 and stores this data in a buffer. The reproducing apparatus then searches for and reads out the next jumping unit JU#2 in the sequence. Accordingly, the reproducing apparatus reads out the audio data of the first auxiliary component in the second jumping unit JU #2, and stores this data in a

respective buffer. This operation then repeats such that the html data of the second auxiliary component stream in the third jumping unit JU #3 is read out and stored in a respective buffer.

[0045] The reproducing apparatus then plays the video data together with the audio and html data. This same procedure then repeats for the subsequent jumping units of data in the main and auxiliary component streams.

[0046] Fig. 5 illustrates one embodiment of the structure of the jumping units in Fig. 4. As shown, each jumping unit is divided into a number of entry points (EPs), which are referenced in an EP map of an associated clip information file. In the embodiment of Fig. 5, each jumping unit JU is formed of a same number 'k' of entry points. However, as shown in Fig. 6 described below, the present invention is not limited to having jumping units with the same number of entry points. Instead each jumping unit may have the same or a different number of entry points. Furthermore, the clip files may differ in that one has jumping units with the same number of entry points and another has jumping units with different numbers of entry points.

[0047] Each entry point included in each jumping unit JU may have a variable time length. Accordingly, the time length of each jumping unit JU may be variable. However, in an alternative embodiment, each entry point may have the same fixed time length.

[0048] Because the record size of each entry point may be time-varying, so may be the record size of each jumping unit. In an exemplary

embodiment, length information about each jumping unit may be recorded in the clip information file associated with the clip file including the jumping unit. The clip information file is used for playback control of the corresponding clip file when accessed by a playlist file, or more specifically a playitem in the playlist file.

[0049] In an exemplary embodiment, the lengths of the jumping units are managed in consideration of buffer underflow and overflow problems. For instance, if the length of a jumping unit is too short, buffer underflow may occur during a big jump; moreover, the number of jumping units and associated length information to manage becomes relatively large.

[0050] If the length of a jumping unit is excessively long, the size of the buffers for the main and auxiliary component streams increases. For instance, if audio data at 384 kbps amounting to a video stream of a two-hour movie was recorded into a single jumping unit and then buffered, a high capacity buffer of 345 Mbytes would be needed.

[0051] Fig. 5 further shows that when a reproducing apparatus is instructed to jump to reproducing different data than that currently reproduced (e.g., such as in response to a trick play request) the jump is to the beginning of an entry point forming the beginning of a jumping unit.

[0052] Fig. 6 illustrates another embodiment of the structure of the jumping units in Fig. 4. As shown in Fig 6, each clip file may be divided into a number of jumping units and each jumping unit JU is formed of a different number of entry points. For example, in one embodiment, each

jumping unit corresponds to a chapter. However, as shown in Fig. 5 described above, the present invention is not limited to having jumping units with different numbers of entry points. Instead each jumping unit may have the same or a different number of entry points. Each entry point included in each jumping unit JU may have a variable time length. Accordingly, the time length of each jumping unit JU may be variable. However, in an alternative embodiment, each entry point may have the same fixed time length.

[0053] The entry point map in the clip information file associated with each clip file includes a jumping flag J_Flag associated with each entry point. Each jumping flag J_Flag indicates whether a jump to another jumping unit is permitted, and if a jump is permitted, the jumping flag J_Flag implies the point in the clip file where the jump takes place in relation to the entry point.

[0054] More specifically, according to one exemplary embodiment of the present invention, a jumping flag "J_Flag = 1" indicates a jump is permitted (active jumping flag), and a jumping flag "J_Flag = 0" indicates that no jump is permitted (inactive jumping flag). Furthermore, according to one exemplary embodiment, when the jumping flag indicates that a jump is permitted, the jumping flag implies that the change is permitted after reproduction of the entry point with which the jumping flag is associated.

[0055] According to another exemplary embodiment of the present invention as shown in Fig. 6, the jumping flags define the boundaries

between jumping units. Namely, as shown in Fig 6, the entry point having an active jumping flag is the last entry point in a jumping unit, and the next entry point is the first entry point in the next jumping unit.

[0056] In an alternative embodiment, a jumping flag "J_Flag = 1" is recorded in the start entry point of each jumping unit JU, whereas a jumping flag "J_Flag = 0" is recorded in the other entry points of each jumping unit JU. In this embodiment, a jump occurs at the point before the entry point with the active jumping flag.

[0057] Fig. 7 illustrates a schematic diagram of an embodiment of an optical disk recording and reproducing apparatus according to the present invention. As shown, a data encoder 9 receives and encodes data (e.g., video data, audio data, etc.). The encoder 9 outputs the encoded data along with coding information and stream attribute information. A multiplexer 8 multiplexes the encoded data based on the coding information and stream attribute information to create, for example, an MPEG-2 transport stream. A source packetizer 7 packetizes the transport packets from the multiplexer 8 into source packets in accordance with the format of the optical disk. As shown in Fig. 7, the operations of the encoder 9, the multiplexer 8 and the source packetizer 7 are controlled by a controller 10. The controller 10 receives user input on the recording operation, and provides control information to encoder 9, multiplexer 8 and the source packetizer 7. For example, the controller 10 instructs the encoder 9 on the type of encoding to perform, instructs the multiplexer 8 on the transport stream to create, and

instructs the source packetizer 7 on the source packet format. The controller 10 further controls a drive 3 to record the output from the source packetizer 7 on the optical disk.

[0058] The controller 10 also creates the navigation and/or management information for managing reproduction of the data being recorded on the optical disk. For example, based on information received via the user interface (e.g., instruction set saved on disk, provided over an intranet or internet by a computer system, etc.) the controller 10 controls the drive 3 to record the data structure of Figs. 2 and 4 and Fig. 5 or 6 on the optical disk.

[0059] During reproduction, the controller 10 controls the drive 3 to reproduce this data structure. Based on the information contained therein, as well as user input received over the user interface (e.g., control buttons on the recording and reproducing apparatus or a remote associated with the apparatus), the controller 10 controls the drive 3 to reproduce the audio/video source packets from the optical disk. This user input may be specified, for example, via a menu based graphical user interface preprogrammed into the controller 10.

[0060] Based on the data structure of the optical disk, the controller 10 controls the reproduction; namely, jumping between the different component data streams.

[0061] The reproduced source packets are received by a source depacketizer 4 and converted into a data stream (e.g., an MPEG-2 transport

packet stream). A demultiplexer 5 demultiplexes the data stream into encoded data. A data decoder 6 decodes the encoded data to produce the original data that was feed to the encoder 9. During reproduction, the controller 10 controls the operation of the source depacketizer 4, demultiplexer 5 and decoder 6. The controller 10 receives user input on the reproducing operation, and provides control information to decoder 6, demultiplexer 5 and the source packetizer 4. For example, the controller 10 instructs the decoder 6 on the type of decoding to perform, instructs the demultiplexer 5 on the transport stream to demultiplex, and instructs the source depacketizer 4 on the source packet format.

[0062] While Fig. 7 has been described as a recording and reproducing apparatus, it will be understood that only a recording or only a reproducing apparatus may be provided using those portions of Fig. 7 providing the recording or reproducing function.

[0063] Fig. 8 illustrates a portion of the recording and reproducing apparatus of Fig. 7 in greater detail. Specifically, Fig. 8 illustrates the connection between demultiplexer 5 and decoder 6 in greater detail. Fig. 8 also illustrates the structure of the decoder 6 in greater detail. As shown, the decoder 6 includes a video buffer 121, and more than one auxiliary buffer 122_1-122_n. As described above with respect to the embodiments of the present invention, the demultiplexer 5 provides the different component data to a respective one of the buffers 121 and 122_1-122_n. Namely, video data is provided to the video buffer 121 and the each type of

auxiliary data (e.g., audio data, html data, Java data, etc.) is provided to a respective one of the auxiliary buffers 122_1-122_n.

[0064] The decoder 6 further includes a video decoder 123 and more than one auxiliary decoder 122_1-122_n. The video decoder 123 is associated with the video buffer 121 and decodes the video data stored in the video buffer. Similarly, each of the auxiliary decoders 122_1-122_n is associated with a respective on of the auxiliary buffers 122_1-122_n, and decodes the respective auxiliary component data stored therein. As described with respect to Fig. 7, the controller 10 controls the operation of the demultiplexer 5 and the decoder 6. Particularly, the controller 10 controls the buffer to which demultiplexed data is stored and the decoding operation performed by the associated decoder. Because the auxiliary component streams may be recorded in different recording formats than the MPEG-2 format of the video component stream, the auxiliary decoders perform decoding operations corresponding to the recording formats of the respective auxiliary component streams as instructed by the controller 10.

[0065] Accordingly, the optical disc apparatus may play a main component stream such as a video data stream and various auxiliary component streams in association with one another.

[0066] Moreover, while not shown, instead of receiving an auxiliary component stream from the optical disk, the optical disk apparatus may receive an auxiliary component stream through a communications network such as the Internet or an external input. In this case, an optical disc

apparatus downloads the auxiliary stream received into one of the auxiliary buffers; and thereafter, the auxiliary stream may be played in conjunction with the main component stream read out and played from the optical disc.

[0067] The data length of the auxiliary stream downloaded in this manner may be prescribed to be the same as that of a jumping unit or determined by interface operations between the optical disc apparatus and Internet servers.

[0068] As will be appreciated from the forgoing disclosure, a method and an apparatus for managing multi-component data of a high-density optical disc according to the present invention and a high-density optical disc according thereto provide a data structure for efficiently managing multiple component data streams. In particular, the data structure provides for efficiently dealing with a component data stream independent of the other component data streams.

[0069] While the invention has been disclosed with respect to a limited number of embodiments, those skilled in the art, having the benefit of this disclosure, will appreciate numerous modifications and variations there from. For example, while described with respect to a Blu-ray ROM optical disk in several instances, the present invention is not limited to this standard of optical disk or to optical disks. It is intended that all such modifications and variations fall within the spirit and scope of the invention.